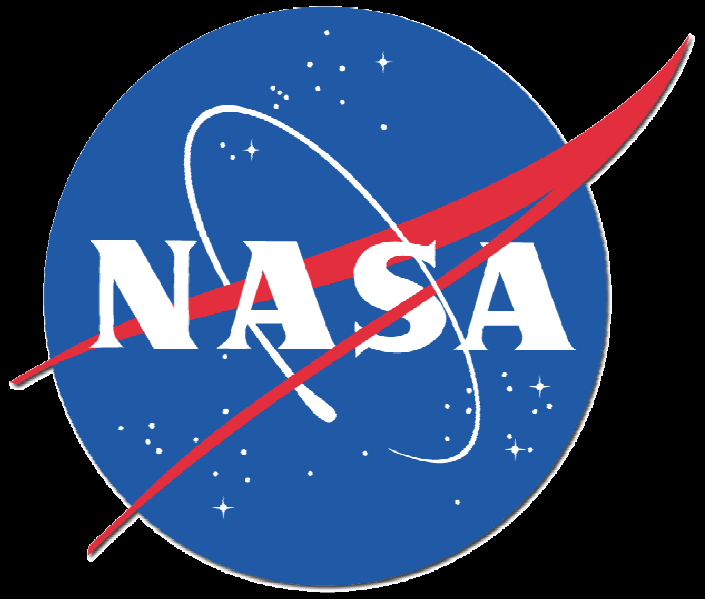
UNCOPUOS



Lori Garver

NASA Deputy Administrator


SEAL OF THE PRESIDENT OF THE UNITED STATES


United States
Russia
Japan
Canada

NASA's Global Reach

458 Agreements: 118 countries and 5 international organizations

Canada

UN

Europe

Austria, Belgium, Bulgaria, Croatia, Cyprus, Czech Republic, Denmark, Estonia, EUMETSAT, ESA, EU, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Liechtenstein, Lithuania, Luxembourg, Macedonia, Malta, Moldova, Monaco, Netherlands, Norway, Poland, Portugal, Romania, Russia, Serbia, Spain, Sweden, Switzerland, Turkey, Ukraine, United Kingdom

East Asia

APCC, China, Japan, Mongolia, Korea, Taiwan

Central and South America

Argentina, Bahamas, Bermuda, Bolivia, Brazil, Chile, Colombia, Costa Rica, Ecuador, El Salvador, Guatemala, Honduras, Mexico, Panama, Paraguay, Peru, Suriname, Trinidad & Tobago, Uruguay

Africa and the Middle East

Algeria, Bahrain, Benin, Burkina Faso, Cameroon, Cape Verde, Chad, Congo, Egypt, Ethiopia, Gabon, Gambia, Ghana, Guinea, Israel, Jordan, Kenya, Kuwait, Lebanon, Madagascar, Mali, Morocco, Mozambique, Namibia, Niger, Nigeria, Qatar, Rwanda, Saudi Arabia, Senegal, South Africa, Tanzania, Tunisia, Uganda, UAE

South and South East Asia

Armenia, India, Bangladesh, Indonesia, Kazakhstan, Kyrgyzstan, Maldives, Nepal, Pakistan, Philippines, Sri Lanka, Thailand, Vietnam

Australia, Fiji, Kiribati, Marshall Islands, Micronesia, New Zealand, Palau

Supporting NASA Grand Challenges

NASA will support technology development and demonstrations that address Grand Challenges by providing a steady cadence of advanced space technology demonstrations allowing the infusion of flexible path capabilities for future exploration.


Make space access economical


Provide economical energy on demand


Develop routine satellite servicing


Forecast natural disasters

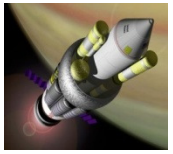

Manage climate change


Provide participatory exploration


Improve spacecraft safety and reliability


Provide carbon-neutral mobility


Protect astronaut health


Engineer faster space vehicles


Unleash machine intelligence


Utilize space resources to explore


Prevent orbital debris


Secure the planet from space threats


Understand physics governing the universe


Establish conditions for permanent humans in space


Develop personalized STEM learning

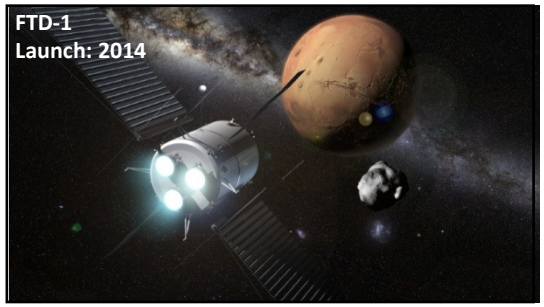

Engineer the tools of scientific discovery


Discover life beyond earth

Flagship Technology Demonstrations (FTD)

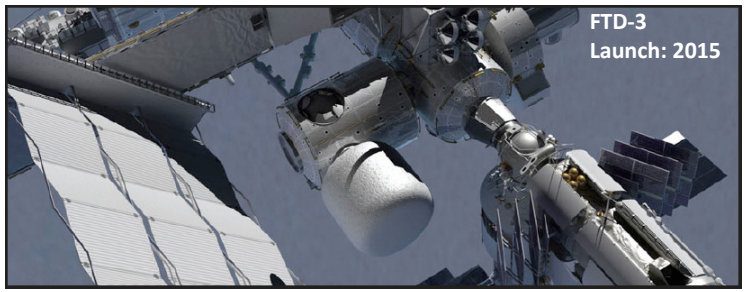
NASA's Flagship Technology Demonstrations (FTD) would capitalize on the technology maturation and ground test bed activities from both within and external to NASA. FTD demonstrates "transformational capabilities" at the proper scale and performance regime necessary to affordably conduct future human exploration missions to select destinations in the inner solar system.

Beginning in 2014, the first set of FTD missions would focus on:

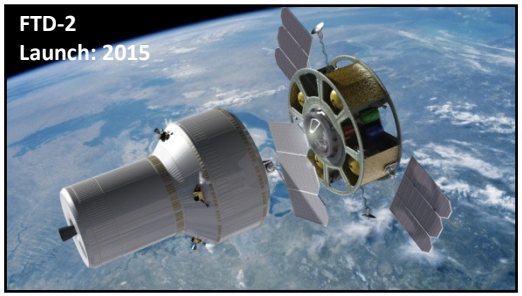


Advanced in-space propulsion

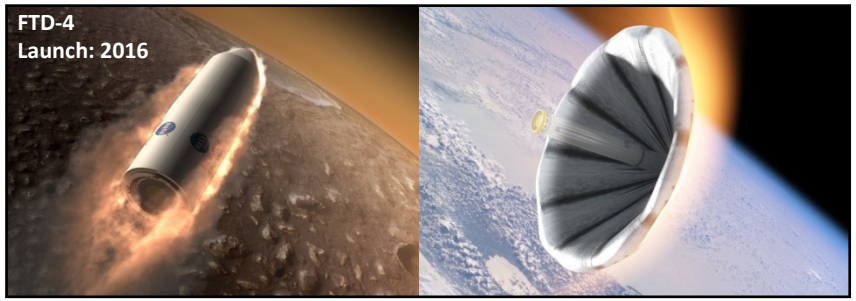
Automated Rendezvous & Docking AR&D



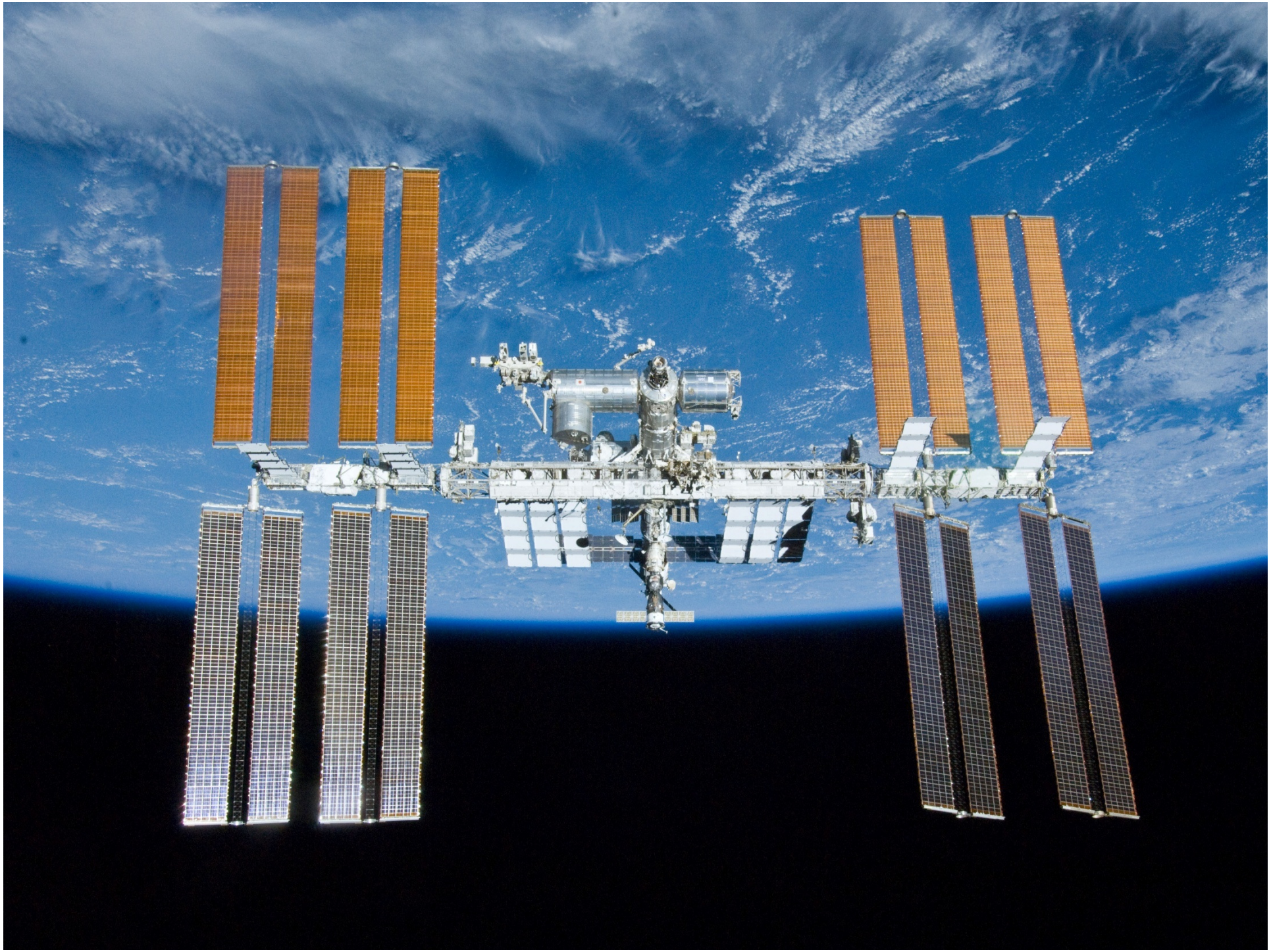
Inflatable ISS mission module, with Closed-loop Environmental Control and Life Support (ECLS)



In-Space propellant transfer and storage



Aero-Assist Entry-Descent-Landing (AEDL)

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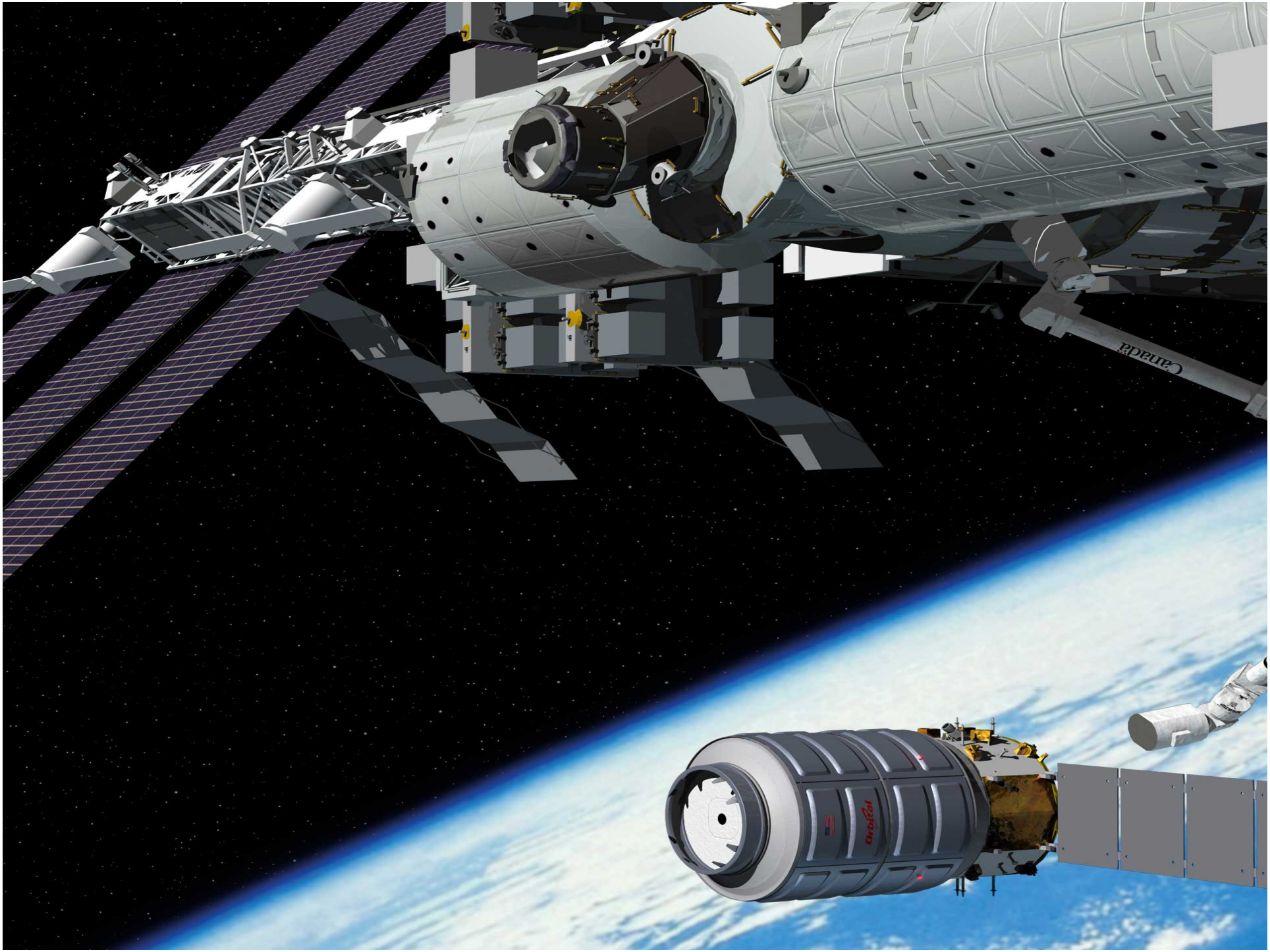
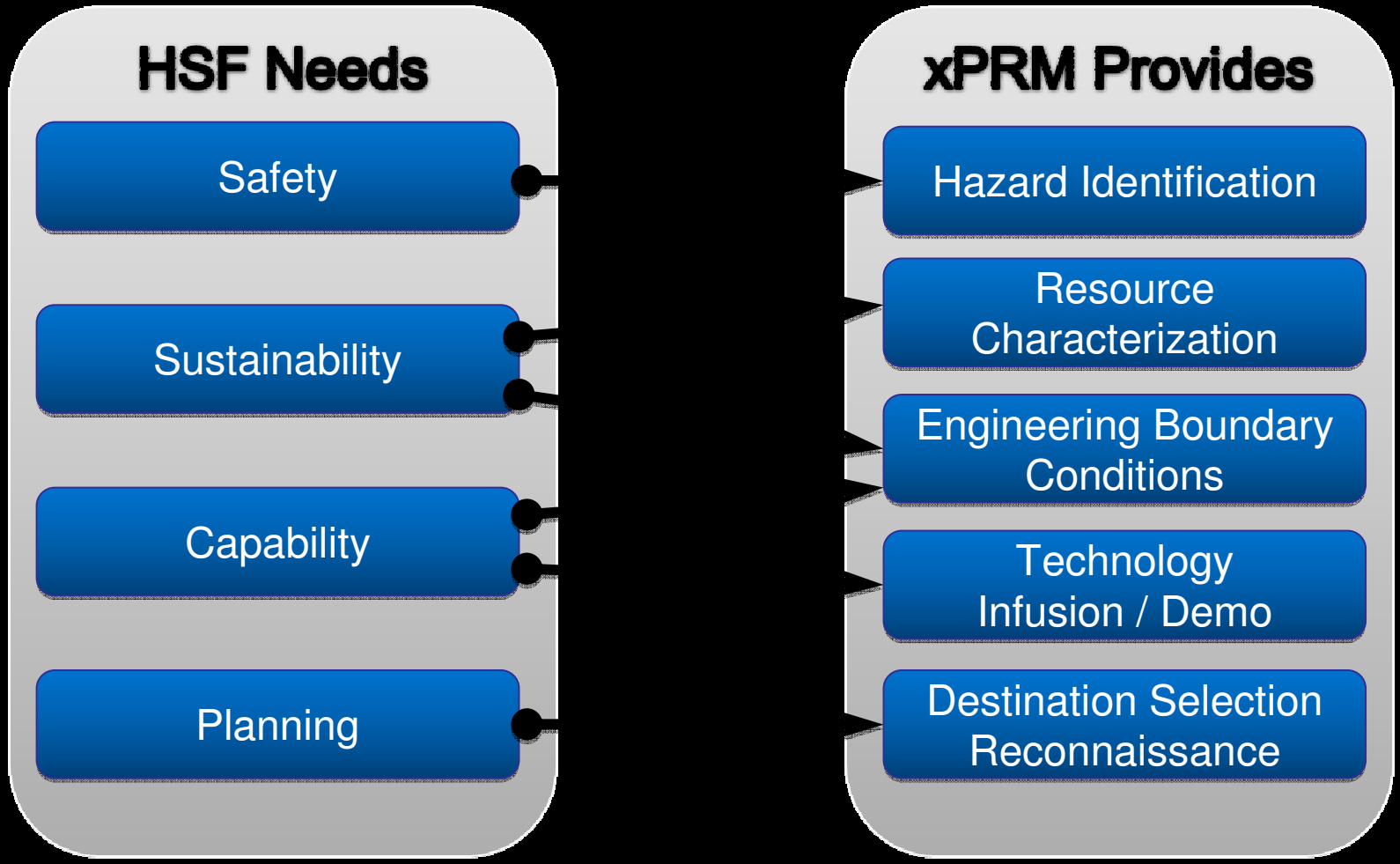

Canada
Orbital

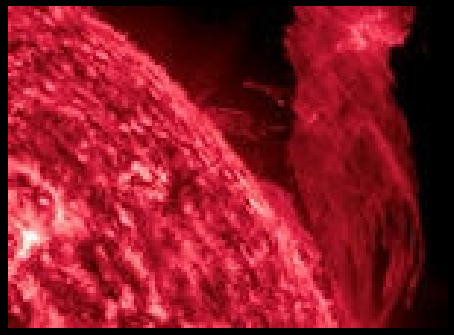
Heavy Lift Propulsion

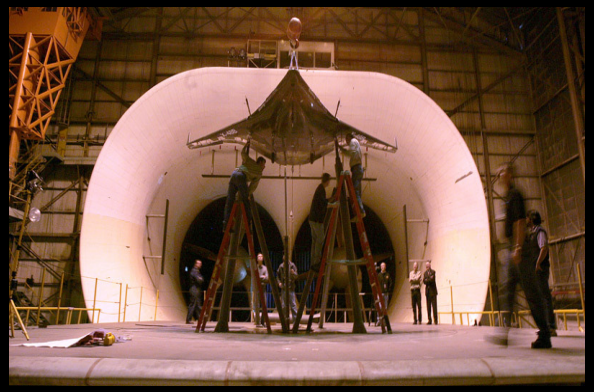
Needs	Goals
Affordability	Reduce the annual cost of propulsion and launch vehicles to enable multiple missions within the expected annual human spaceflight budget
	Demonstrate by test and analysis propulsion contribution to system affordability
Capability to Perform Multiple Missions	Provide research and development of chemical propulsion elements to enable heavy space lift, space transfer, rendezvous, proximity maneuvers, descent/ascent for multiple destinations
Risk Reduction	Mature chemical propulsion technologies to enable system level demonstrations of mission capability in relevant environments
Transform Industrial Base	Creating a competitive environment of multiple suppliers (across the supply chain), improved capability, and reduced cost
	Ensure world leading national (industry, academia, government) R&T capability for chemical propulsion
Timeframe (Availability)	Demonstrate RP propulsion leading to Flight certification NLT 2020
	Flight demonstrate LOX/CH4 engine by 2015
	Demonstrate upper stage, ascent/descent, and other propulsion systems to complete development readiness by 2020
	Finalize a LV design no later than 2015 and support a human mission to NEO by 2025
Partnership	Form a partnership with DoD for the research, technology and development for a large RP booster engine and a high energy upper stage engine
	Listen to industry and provide a low cost propulsion technology to enable growth in the commercial launch industry
	Investigate use of collaborative efforts with internationals in line with domestic goals and objectives
Innovation	Creating opportunities for new businesses and academia
	Actively engage the public in participating in this journey

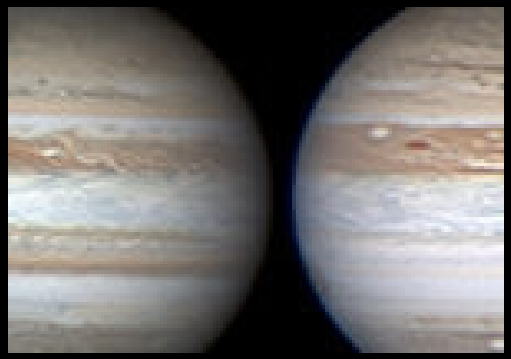
Why Exploration Precursor Robotic Missions?

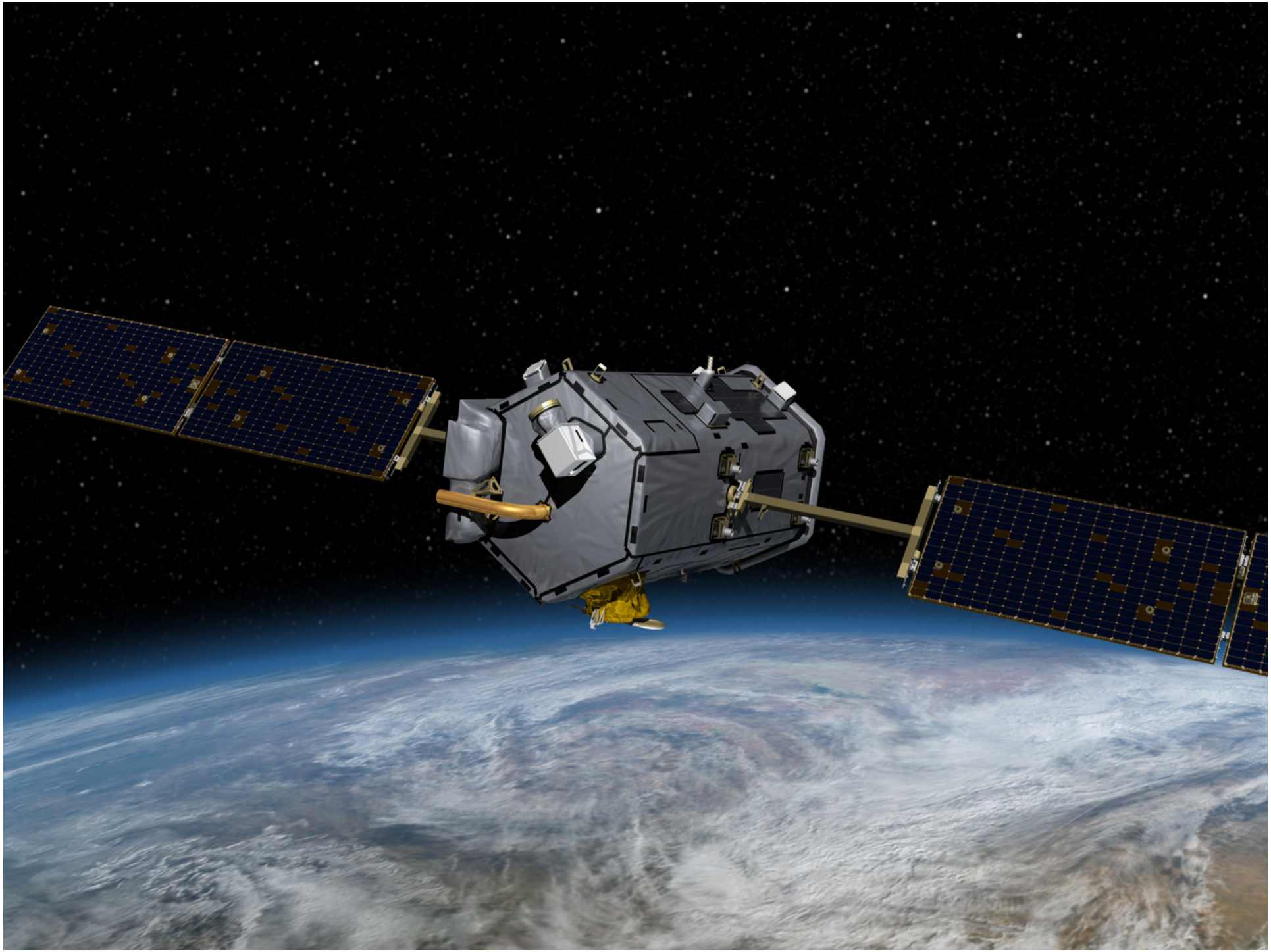
Enabling Human Space Flight proactively…

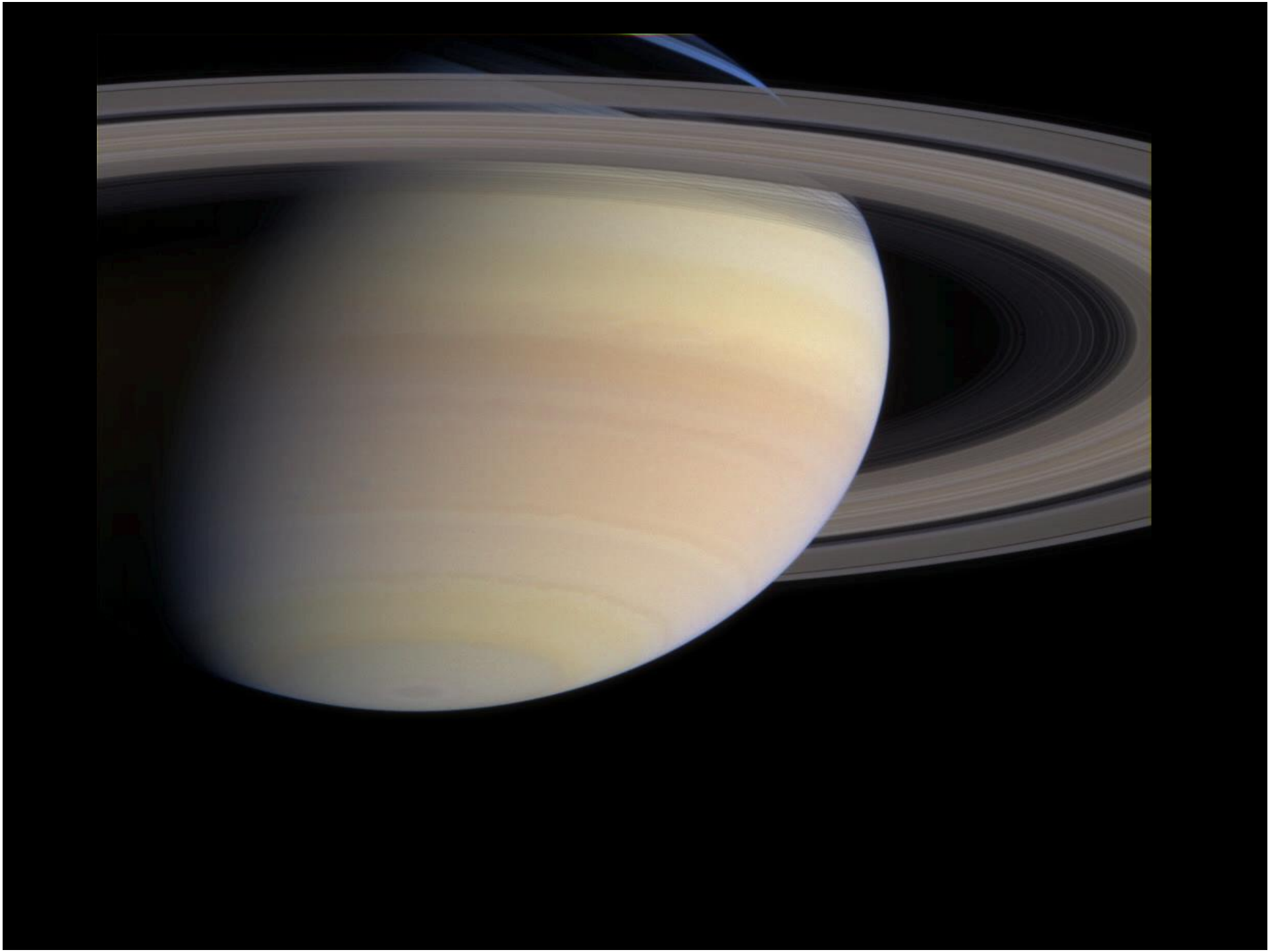


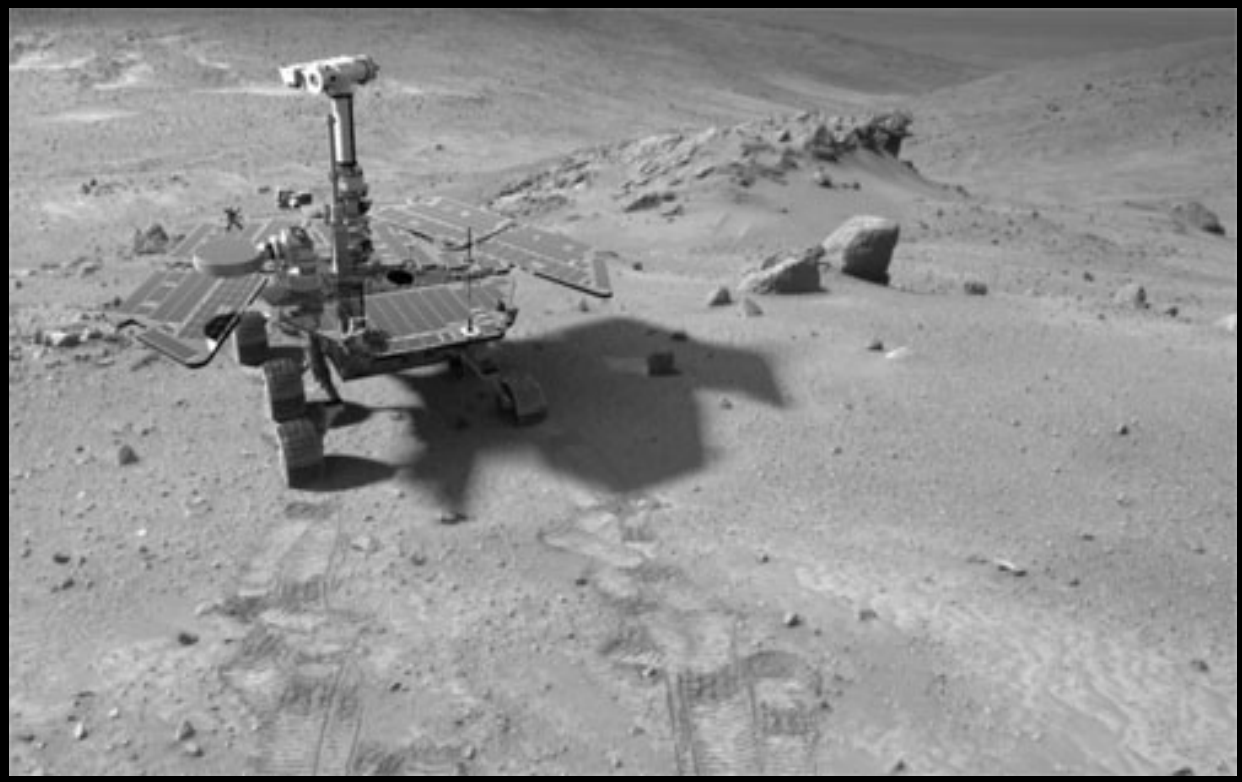


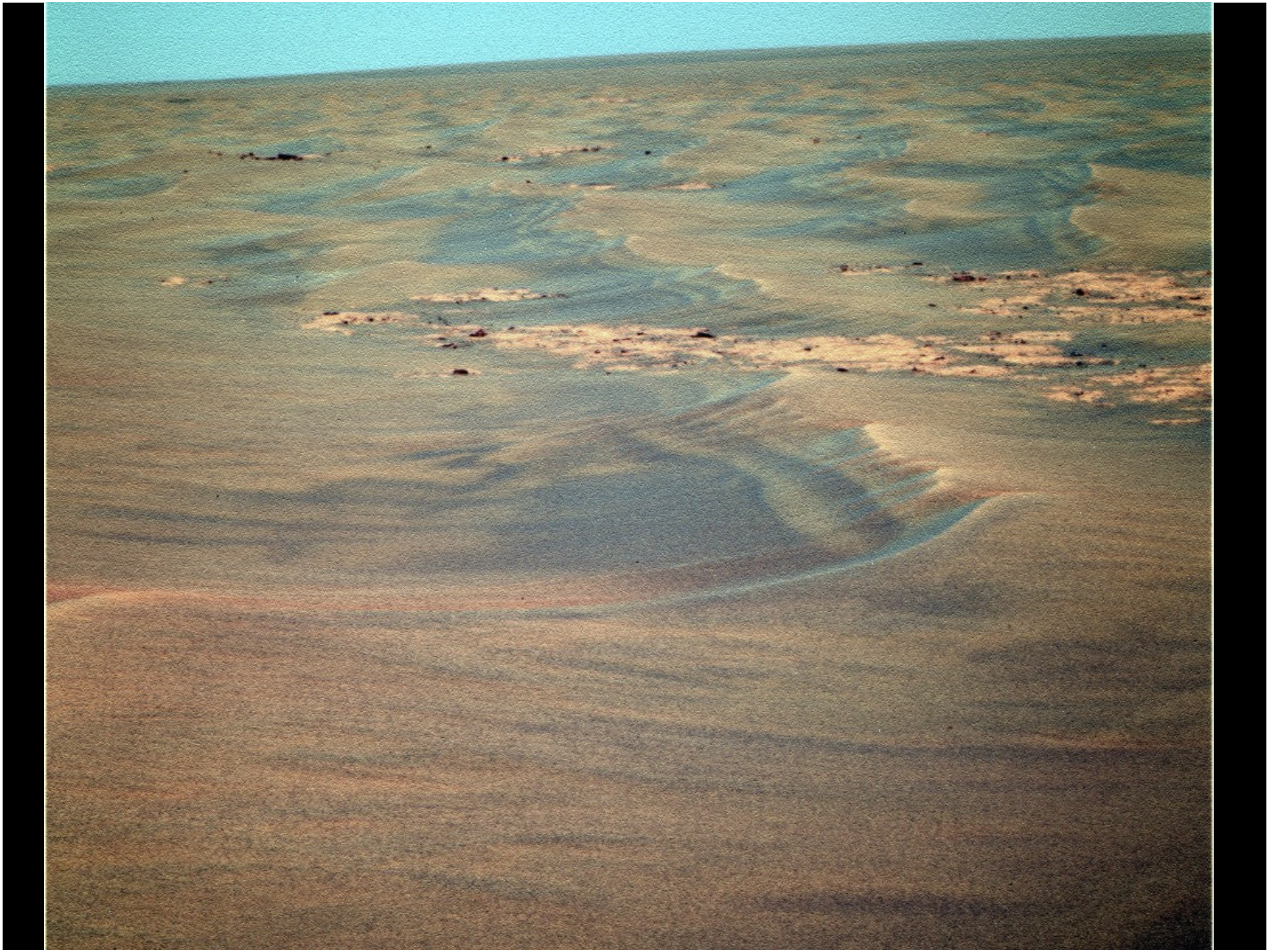


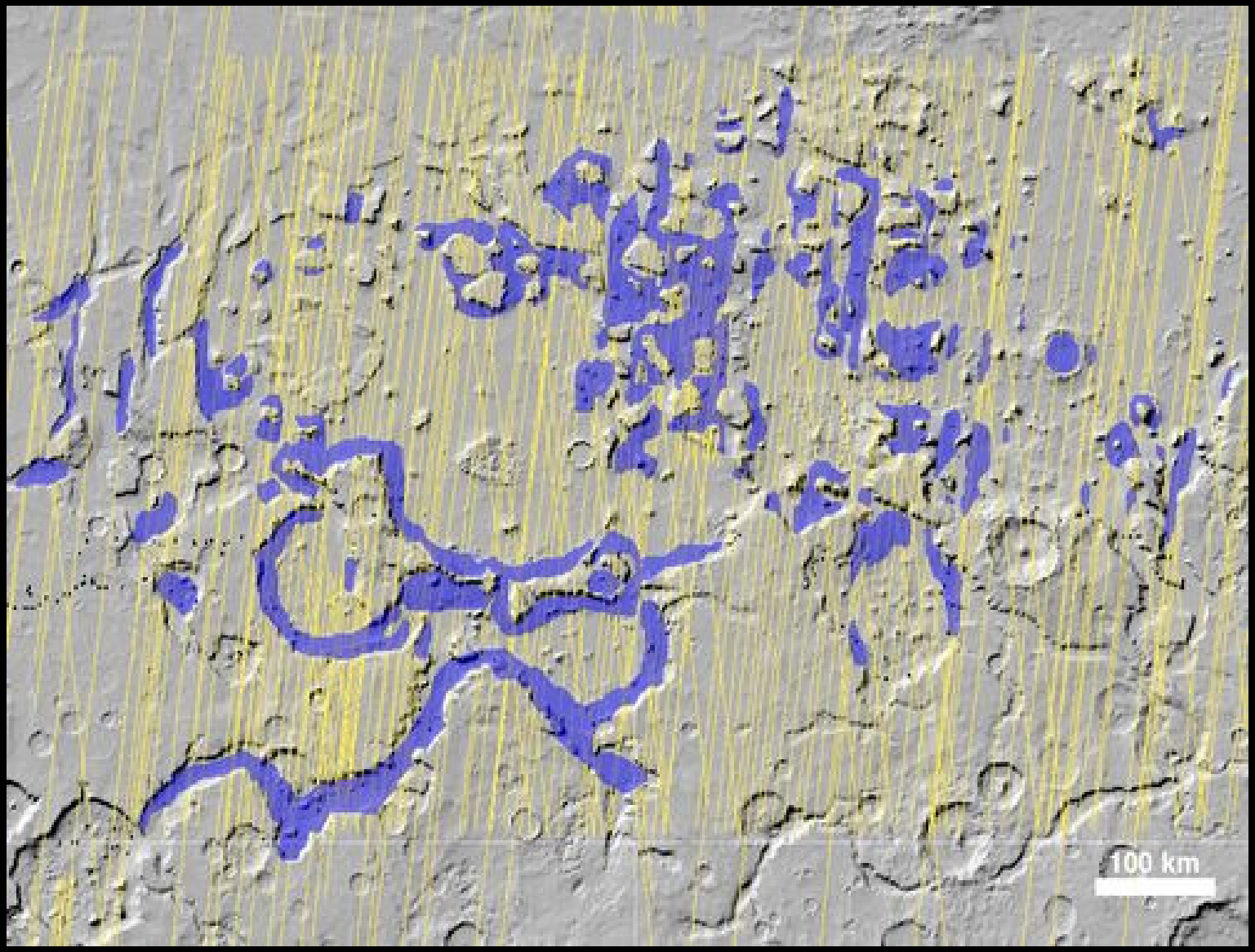


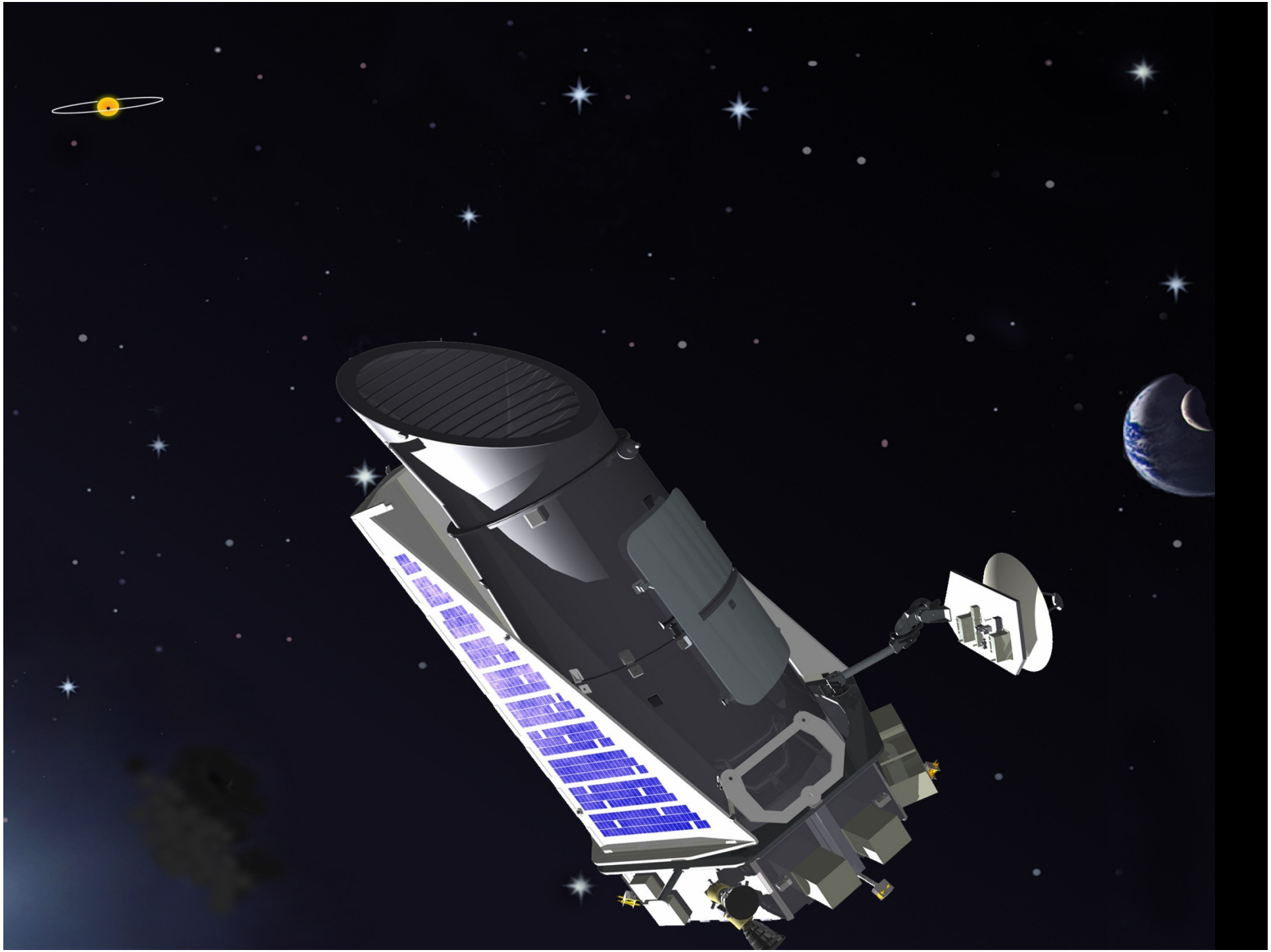


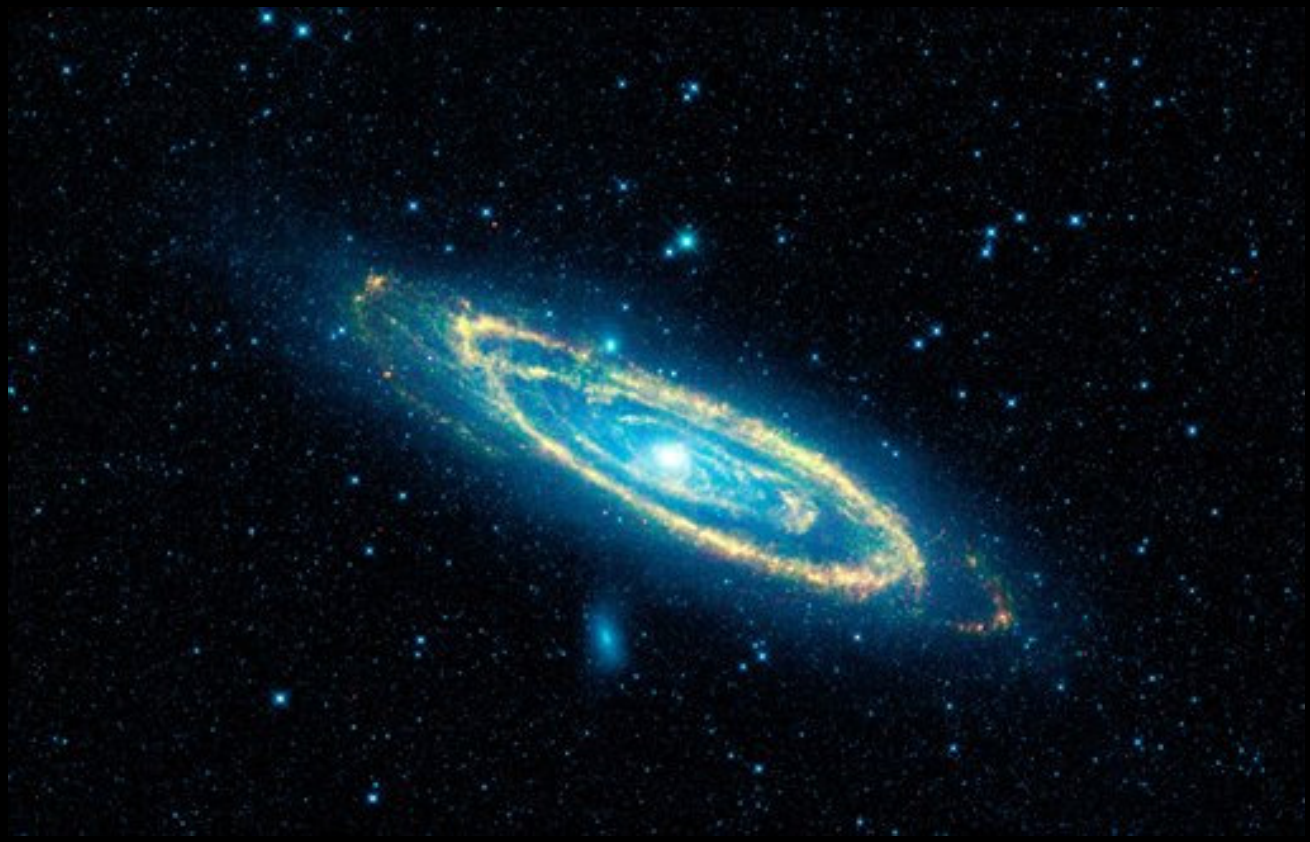


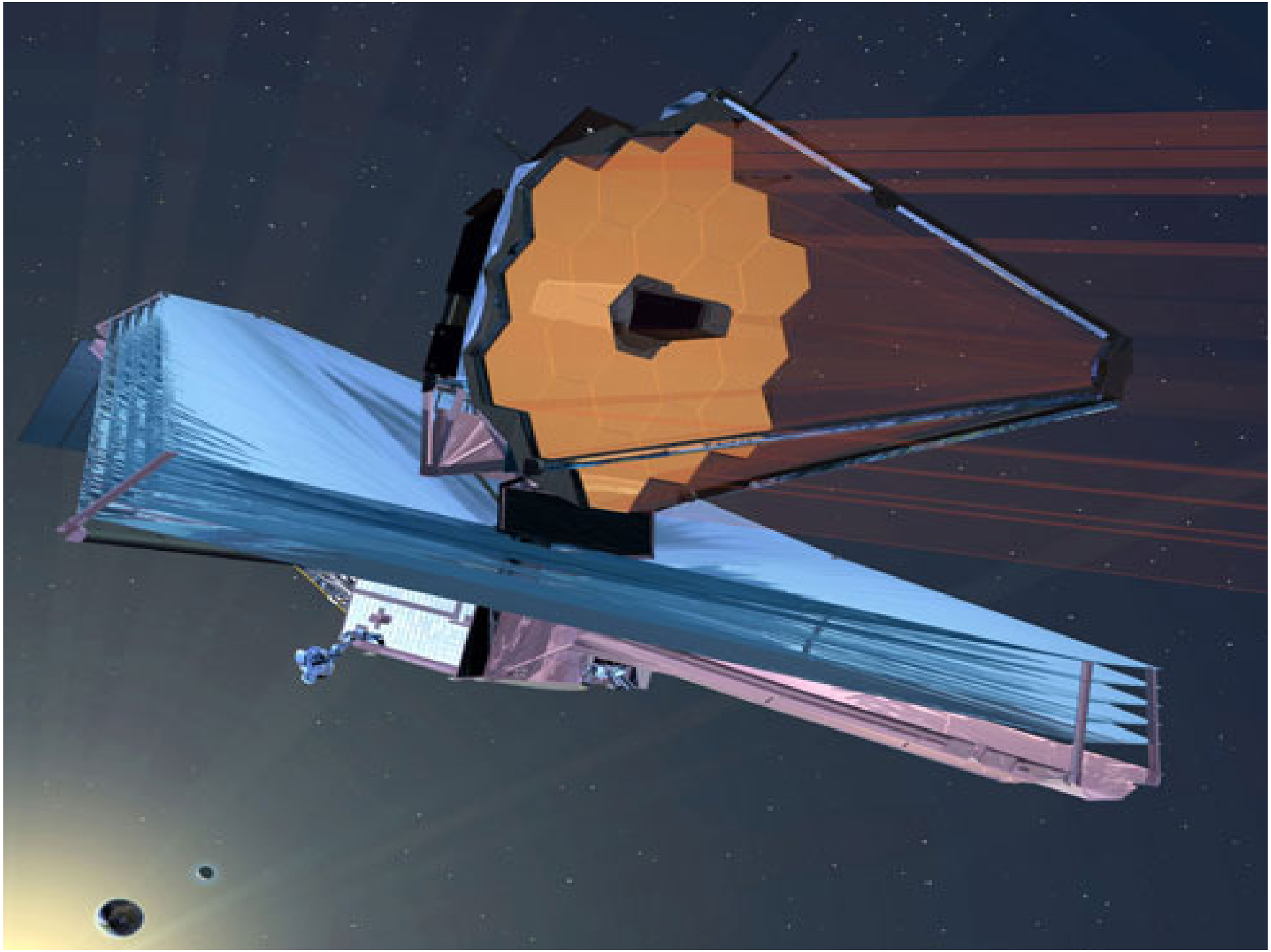


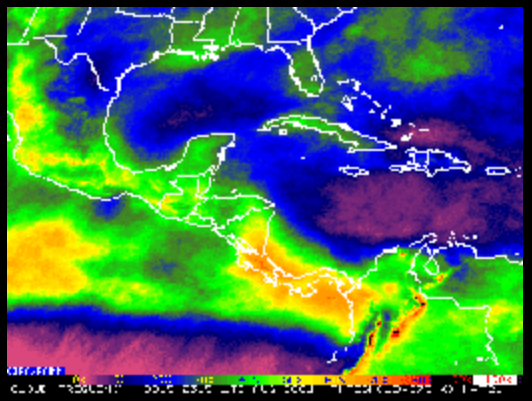


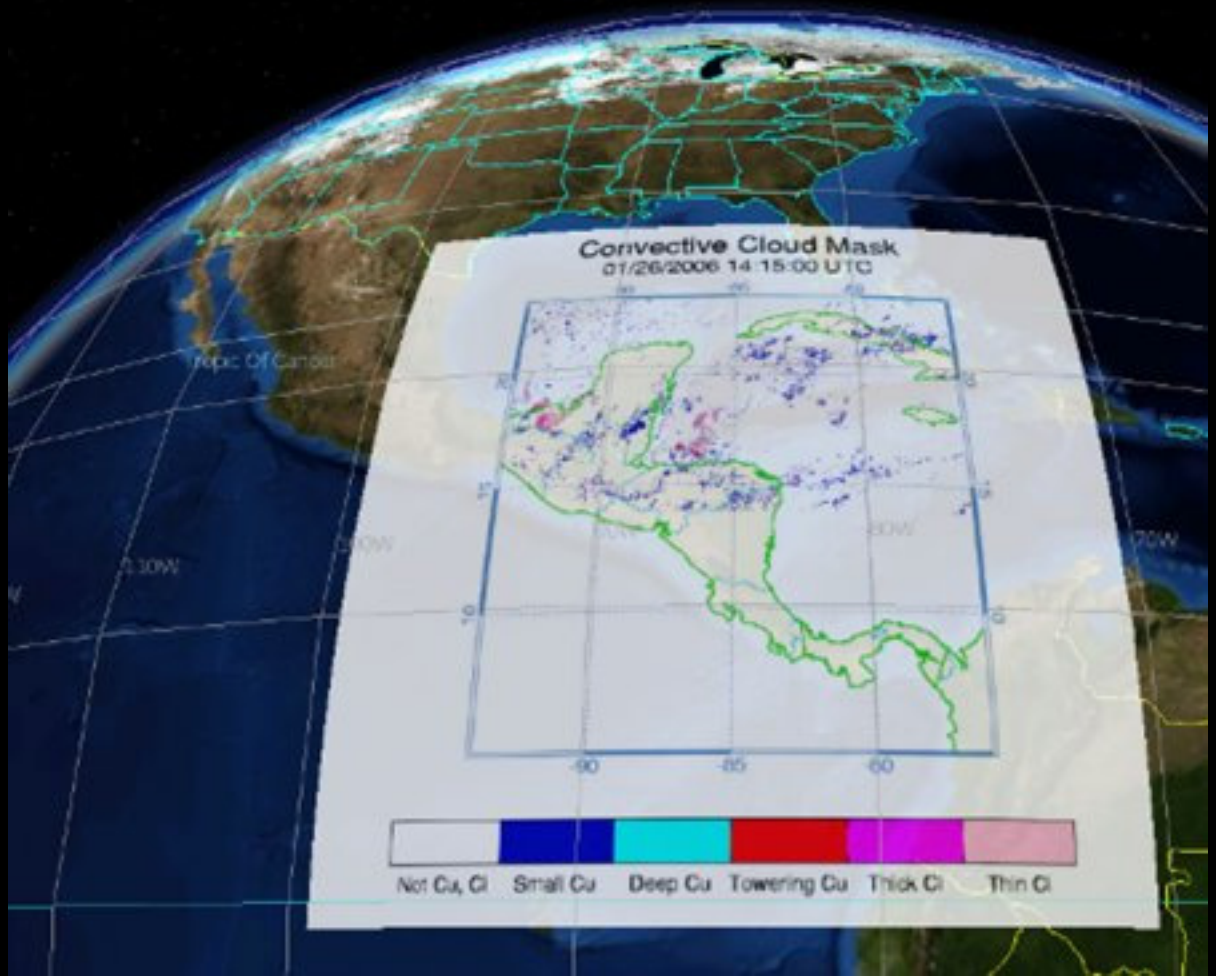

100 km







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Small Cu
Deep Cu
Towering Cu
Thick Ci
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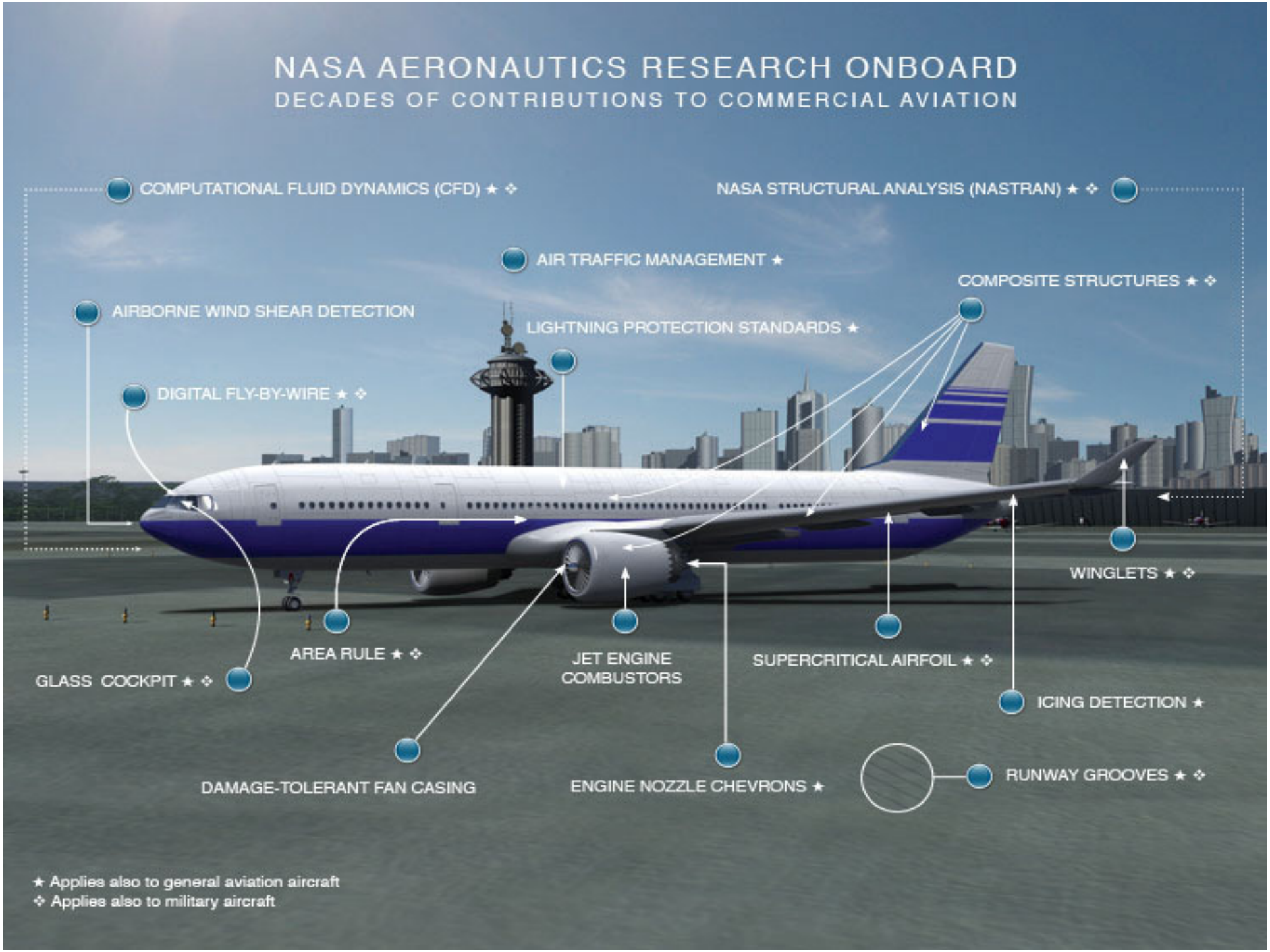
NASA AERONAUTICS RESEARCH ONBOARD
DECADES OF CONTRIBUTIONS TO COMMERCIAL AVIATION
COMPUTATIONAL FLUID DYNAMICS (CFD) ★ ❖
NASA STRUCTURAL ANALYSIS (NASTRAN) ★ ❖
AIR TRAFFIC MANAGEMENT ★
COMPOSITE STRUCTURES ★ ❖
AIRBORNE WIND SHEAR DETECTION
LIGHTNING PROTECTION STANDARDS ★
DIGITAL FLY-BY-WIRE ★ ❖
WINGLETS ★ ❖
AREA RULE ★ ❖
JET ENGINE COMBUSTORS
SUPERCRITICAL AIRFOIL ★ ❖
GLASS COCKPIT ★ ❖
ICING DETECTION ★
DAMAGE-TOLERANT FAN CASING
ENGINE NOZZLE CHEVRONS ★
RUNWAY GROOVES ★ ❖
★ Applies also to general aviation aircraft
❖ Applies also to military aircraft


CSA ASC
esa
JAXA
DLR
BNSC
cnes
CSIRO
NASA
KARI